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This publication is designed to extend and strengthen the computational skills and mathematical understandings of children in Grades 2 and 3. It presents an overall scope and detailed sequence for implementation by teachers and supervisors, based on the modern program introduced in pre-kindergarten, kindergarten and first grade classes. The scope and sequence for this publication is presented in the form of units which are organized around four central themes--(1) Sets, Number, and Numeration, (2) Operations, (3) Geometry and Measurement, and (4) Problem Solving. The sequence is structured to provide a spiral or cyclic approach for presentation of the concepts and skills. (RP)

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MATHEMATICS

- Grade 2
- Grade 3

ED025421

Scope and Sequence

BUREAU OF CURRICULUM DEVELOPMENT
BOARD OF EDUCATION OF THE CITY OF NEW YORK

SE005 620

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MATHEMATICS

Grade 2
Grade 3

Scope and Sequence

BUREAU OF CURRICULUM DEVELOPMENT
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FOREWORD

This publication is designed to extend and strengthen the computational skills and mathematical understandings of children in Grades 2 and 3. It presents an overall scope and detailed sequence for implementation by teachers and supervisors, based on the modern program already introduced in pre-kindergarten, kindergarten and first grade classes. Teaching manuals are now being prepared to assist teachers to translate scope and sequence into specific learning activities for children.

The bulletin has been jointly developed by staff members of the Bureau of Curriculum Development and the Bureau of Mathematics. We express appreciation to them for this contribution to relevancy in mathematics instruction.

SEELIG LESTER
Deputy Superintendent of Schools

May 1968

CONTENTS

Page

Introduction

Mathematical Understandings for Grade 2 1

Scope and Sequence: Grade 2 3

Mathematical Understandings for Grade 3 15

Scope and Sequence: Grade 3 17

INTRODUCTION

The scope and sequence for Mathematics: Grade 2,and for Mathematics: Grade 3 is presented in the form of units each of which may require one or more lessons.

The units are organized around four central themes. These themes are coded as shown below:

* Sets; Number; Numeration
** Operations
*** Geometry and Measurement
**** Problem Solving

The sequence is structured to provide a spiral or cyclic approach for presentation of the concepts and skills.

A time schedule is also included. The suggested minimum number of teaching lessons necessary for the development of each unit is indicated in parentheses following the description of the unit.

The teacher should make provision for review, reinforcement, practice, and evaluation. The time allotment should be adjusted to meet the particular needs of the class.

.....

The preparation of this bulletin was under the general direction of George Grossman, Director, Bureau of Mathematics and Leonard Simon, Assistant Director (Acting), Bureau of Curriculum Development.

Alice D. Lombardi and Bertha O. Weiss, assigned to Mathematics Grade 2, 3 Revision Project of the Bureau of Curriculum Development, prepared this material.

Appreciation is expressed to Frances Moskowitz for her assistance in processing the materials.

Aaron N. Slotkin, Editor, Bureau of Curriculum Development, had overall responsibility for design and production. Simon Shulman designed the cover.

MATHEMATICS: GRADE 2

The scope and sequence for Grade 2 is presented in the form of 67 units for which a minimum of 120 teaching lesssons is indicated.

The development of concepts and operations is presented in a cyclic pattern. For example, the development for the understanding of the conventional algorithm for addition of whole numbers begins in Unit 24, continues in Units 25 and 26, and this understanding is reinforced and extended in Units 36, 37, 46, 47, and 54.

To provide a brief overview of the mathematical understandings and skills for Grade 2, the following is presented:

Mathematical Understandings for Grade 2

1. Number; Numeration

   Count by hundreds, tens and hundreds to 10 hundreds
   Understand place value and record in expanded notation to 100
   Round numbers to nearest decade

2. Addition

   Basic facts
   Algorithm: vertical format, two addends, sums through 99, with and without exchange
   Column addition: more than two addends, sums through 99, no exchange
   Addition and subtraction as related operations
   Observe and use commutative and associative properties of addition

3. Subtraction

   Basic facts
   Algorithm: vertical format, regrouping minuend, 1 ten for 10 ones
   Subtraction as comparison-difference, missing addend

4. Multiplication

   Counting by twos through 10, by threes through 15, by fours through 20, by fives through 25
   Basic facts: twos through 5 twos, threes through 5 threes, fours through 5 fours, fives through 5 fives
   Observe commutative property of multiplication

5. Division

   Counting backwards by twos from 10, by threes from 15, by fours from 20, by fives from 25
   Basic facts: twos through the number of twos in 10, threes through the number of threes in 15, fours through the number of fours in 20, fives through the number of fives in 25

6. Fractional Numbers

Concept of thirds of a whole
Finding $\frac{1}{2}$, $\frac{1}{4}$, of a number of things
Equivalence: fourths and halves

7. Geometry

Concepts: point, line segment, ray, line
Properties of geometric figures: rectangle, square, triangle, circle
Recognition of the differences between symmetrical and asymmetrical patterns

8. Measurement

Linear: foot, inch, half-inch
Money: penny, nickel, dime, quarter, half-dollar, dollar
Capacity: pint
Quantity: dozen, half-dozen
Weight: ounce
Time: clock - half-hour
calendar - number of months in year
Temperature: non-standard units of measure

9. Other Content Included

Concepts from sets, algebra, and probability; problem solving and reasoning

***

31. Measurement: Money

Use activities to reinforce understanding of relationships among penny, nickel, dime, quarter, half-dollar, dollar

(1 lesson)

*

32. Numeration: Dollars system

Using money and symbols, introduce counting and recording money values in dollars and cents, e.g., $3.45

(2 lessons)

**

33. Addition and Subtraction:

Using experiences, develop skill in computing sums and differences in dollars - cents system

(1 lesson)

***

34. Geometry:

Reinforce understanding of curve, closed curve, simple closed curve
Develop concept of polygon: quadrilateral, rectangle, square, triangle
Discover properties of different polygons

(2 lessons)

**

35: Multiplication of Whole Numbers:

Reinforce facts for twos, for threes
for fours through 5 fours, for fives through five fives
Develop facts for fours through 9 fours
for fives through 9 fives
Record horizontally and vertically
Observe and use commutative property of multiplication

(2 lessons)

**

36. Division of Whole Numbers:

Reinforce facts for twos, for threes
for fours through the number of fours in 20
for fives through the number of fives in 25
Develop facts for fours in 24; in 28; in 32; in 36
for fives in 30; in 35; in 40; in 45

(2 lessons)

*

37. Number: Fractional numbers

Using activities, reinforce concept of halves and fourths of whole
Develop: concept of eighths of a whole
understanding of equivalence: halves - fourths - eighths
Use number ray

(2 lessons)

**

38. Operations: Fractional numbers

Using physical objects, reinforce finding $\frac{1}{4}$ of a number of things
Develop finding $\frac{1}{8}$ of a number of things
Develop finding $\frac{1}{4}$, $\frac{1}{8}$ of numbers

(2 lessons)

****

39. Graphs: Pictograph

Use experience situations to construct and interpret pictographs

(1 lesson)

**

40. Multiplication of Whole Numbers:

Reinforce facts for twos, for threes, for fours, for fives
Using distributive property of multiplication over addition, extend multiplication beyond 9 fours, 9 fives
Develop facts for six through 9 sixes
Observe and use commutative property of multiplication

(3 lessons)

**

41. Division of Whole Numbers:

Reinforce facts for twos, for threes, for fours, for fives
Develop facts for sixes through the number of sixes in 54

(2 lessons)

*

42. Numeration: Roman numerals

Use activities to reinforce the repetitive, additive, and subtractive principles of Roman system of numeration (symbols I-X)
Use Roman numerals I, V, X to represent numbers

(2 lessons)

**

43. Multiplication of Whole Numbers:

Reinforce multiplication facts developed in previous units
Using distributive property of multiplication over addition, extend multiplication beyond 9 sixes
Develop facts for sevens through 9 sevens
Observe and use commutative property of multiplication

(3 lessons)

**

44. Division of Whole Numbers:

Reinforce division facts developed in previous units
Develop facts for sevens through the number of sevens in 63

(2 lessons)

**

45. Addition of Whole Numbers:

Develop skill in computing sums: two addends each expressed by a 3-digit numeral
two exchanges, 10 ones for 1 ten and 10 tens
for 1 hundred
vertical format

(2 lessons)

****

46. Problem Solving:

Reinforce procedures for analyzing and solving problems
a. use materials and experiences to concretize problems
b. introduce problems with insufficient and extraneous data

(2 lessons)

**

47. Multiplication of Whole Numbers:

Reinforce multiplication facts developed in previous units
Develop facts for eights through 9 eights; for nines through 9 nines
Observe and use commutative property of multiplication
Using distributive property of multiplication over addition, extend multiplication beyond 9 sevens, 9 eights, 9 nines

(3 lessons)

**

48. Division of Whole Numbers:

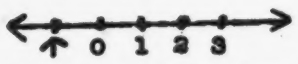
Reinforce division facts developed in previous units
Develop facts for eights through the number of eights in 72
for nines through the number of nines in 81

(2 lessons)

*

49. Number:

Use games, number line, experiences to introduce concept of negative number, e.g.,



1 less than zero

2 is 1 less than 3
1 is 1 less than 2
0 is 1 less than 1
What is 1 less than zero?

(1 lesson)

***

50. Measurement: Temperature

Develop an understanding of the measurement of temperature above and below zero degrees

(1 lesson)

**

51. Multiplication of Whole Numbers:

Develop an understanding of
a. "1" as the identity element for multiplication
b. role of zero in multiplication

(1 lesson)

**

52. Division of Whole Numbers:

Develop an understanding of role of "1" in division

(1 lesson)

**

53. Multiplication of Whole Numbers:

Using distributive property of multiplication over addition, develop:
a. multiplying ten and multiples of 10 by 2, 3, 4, etc.
b. multiplying numbers through 50 or more by 2, 3, 4, etc.
For example,

$$2 \times 23 = (2 \times 20) + (2 \times 3)$$
$$= 40 + 6$$
$$= 46$$

(2 lessons)

**

54. Addition of Whole Numbers:

Develop skill in column addition with exchange
Use word problems, dollars and cents

(1 lesson)

**

55. Subtraction of Whole Numbers:

Develop skill in subtraction: minuend and subtrahend each expressed by a 3-digit numeral
two regroupings by exchanging 1 hundred for 10 tens and 1 ten for 10 ones, e.g.,

$$\begin{array}{r} 334 \\ -146 \\ \hline \end{array}$$

(2 lessons)

**

56. Multiplication of Whole Numbers:

Reinforce multiplication of numbers 10 through 99 by numbers less than 10
Lead to vertical format

(2 lessons)

**

57. Multiplication of Whole Numbers:

Use the distributive property of multiplication over addition to develop patterns when multiplying by numbers greater than 9

For example,

10 x 6 = 60
11 x 6 = (10x6) + (1x6)
12 x 6 = (10x6) + (2x6)
etc.

(2 lessons)

**

58. Division of Whole Numbers:

Introduce procedures for recording division in vertical format
Divisors: numbers less than 10
Dividends: numbers less than 100
No remainder
Because children may need to record steps in their thinking in a variety of ways, the illustrations shown are only a few of the possible steps in the development
For example,

$$\begin{array}{rl} & 2\overline{)48} \\ 9\times2 = & \underline{18} \\ & 30 \\ 9\times2 = & \underline{18} \\ & 12 \\ 6\times2 = & \underline{12} \\ & 0 \end{array}$$

still to divide

still to divide

$$\begin{array}{r|l} 2\overline{)48} & \\ \underline{18} & 9 \\ 30 & \\ \underline{18} & 9 \\ 12 & \\ \underline{12} & 6 \\ 0 & 24 \end{array} \qquad \begin{array}{r|l} 2\overline{)48} & \\ \underline{20} & 10 \\ 28 & \\ \underline{20} & 10 \\ 8 & \\ \underline{8} & 4 \\ 0 & 24 \end{array} \qquad \begin{array}{r|l} 2\overline{)48} & \\ \underline{40} & 20 \\ 8 & \\ \underline{8} & 4 \\ 0 & 24 \end{array}$$

(2 lessons)

***

59. Measurement: Linear

Using experiences, reinforce and develop inch, foot, yard
Through activities, guide pupils to discover distribution of variation in measurements

(1 lesson)

*

60. Numeration:

Use materials such as squared materials, bundles of sticks, abacus, etc., to
a. reinforce place value to

H	T	O
9	9	9

b. group by thousands, hundreds, tens, ones

Th	H	T	O
1	0	0	0

c. introduce place value to thousands
d. count by thousands to 10 thousands
e. read and write numerals for numbers to 10,000

(2 lessons)

*

61. Number:

Reinforce rounding numbers to nearest 10
Develop rounding numbers to nearest hundred to prepare children for estimating solutions to problems

(2 lessons)

**

62. Operations: Fractional numbers

Reinforce finding $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$, $\frac{1}{3}$, $\frac{1}{6}$ of whole numbers, no remainders
Using activities and materials, develop finding nonunit fractional parts of whole numbers, e.g., $\frac{2}{3}$ of 6 lollipops

(2 lessons)

****

63. Graphs: Bar graph

Use experience situations to construct and interpret bar graphs.
An activity which develops the understanding of frequency may provide data for constructing a bar graph.
Observe and record the number (frequency) of automobiles driven past the school yard between noon and 1 P.M. for each school day in one week

(1 lesson)

***

64. Measurement: Capacity

Using experiences, reinforce concept of quart, of pint, of cup, and develop concept of gallon
Reinforce concept of variation in measurement

(1 lesson)

**

65. Multiplication of Whole Numbers:

Construct multiplication table to reinforce multiplication facts
Use table to explore patterns in multiplication

(1 lesson)

***

66. Measurement: Speed

Develop non-numerical comparisons of time and speed
Develop understanding of speed as a function of time that often also involves distance

(1 lesson)

***

67. Geometry: Symmetry

Experiment with mirrors to discover and recognize symmetrical patterns

(1 lesson)

****

68. Probability:

Develop understanding of outcome in a two-possibility event as one chance

MATHEMATICS: GRADE 2

Preliminary Scope and Sequence

*

1. Sets: Review set concepts

   Use as a universal set a set of blocks to reinforce

   a. meaning of a set
   b. elements of a set
   c. number property of a set
   d. subsets

(1 lesson)

*

2. Sets: Use one-to-one matching to reinforce and develop

   a. comparing sets; equivalent sets; non-equivalent sets
   b. cardinal number of a set; symbols for numbers (numerals, word names)
   c. symbols for inequalities: >, < for comparing two numbers
   d. order of counting numbers; zero; the set of whole numbers

(2 lessons)

*

3. Number: Ordinals

   Recall first through tenth from any starting point
   Develop through twentieth and beyond

(1 lesson)

***

4. Geometry: Use physical representations to picture geometric ideas

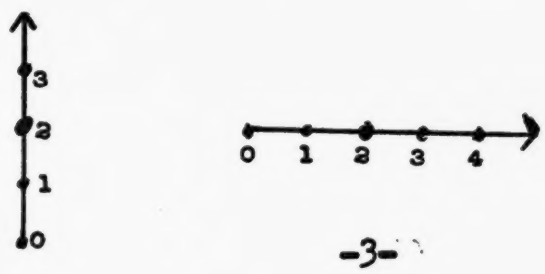
   a. point
   b. line segment
   c. line
   d. ray

(2 lessons)

***

5. Geometry: Number ray

   Graph points associated with numbers on a vertical number ray; on a horizontal number ray



(1 lesson)

*

6. Numeration: Use physical objects to

   a. count by ones, tens
   b. count by tens and ones through 100
   c. group by tens and ones
   d. record: tally, expanded form, e.g., 1 ten and 3 ones
      10 + 3
      13

(2 lessons)

***

7. Measurement: Money

   Develop relationships among penny, nickel, dime, quarter
   Distinguish between coin and its value

(1 lesson)

****

8. Mathematical Sentences: Concept of a mathematical sentence as true, false, open

   Use of placeholders: □, ?, n, etc.
   Use symbols +, -, =, >, < to write number stories as mathematical sentences

(2 lessons)

**

9. Addition of Whole Numbers: Recall sums 10 or less by

   Relating joining of sets to adding of numbers; reinforcing the concept that a number has many names, e.g., 5 may be 3+2 or 4+1, etc., showing that the order of addends does not affect sum, e.g., 3+2 = 2+3 (Commutative Property)

   Develop sums 11, 12 through

   a. experiences and activities with physical objects
   b. associative property: rename second addend to reach 10, e.g., 8+3 = 8+(2+1)
   c. number ray to record adding a number to a given number = (8+2)+1

   Record horizontally and vertically, e.g., 8+3 = □ 8
                                                  +3

(2 lessons)

**

10. Subtraction of Whole Numbers: Recall minuends 10 or less by

   Relating removing of a subset from a given set to subtracting numbers (finding what is left; finding the remainder); emphasizing the concept of addition and subtraction as related operations, e.g., 3+4 = 7
                                                                                                                                                                                  7-4 = 3

   Develop subtraction using minuends 11, 12 through

   a. experiences and activities with physical objects

b. "getting back to ten" by renaming the subtrahend, e.g., 11-3 = (11-1) - 2
c. number ray

Record horizontally and vertically, e.g., 12-3 = □

$$\begin{array}{r} 12 \\ -\ 3 \\ \hline \end{array}$$

(2 lessons)

***

11. Measurement: Time: Calendar

Reinforce and develop order of months in the year; number of months in the year; number of days in a month

(1 lesson)

*

12. Number: Ordinals

Reinforce and develop ordinal numbers beyond twentieth

(1 lesson)

**

13. Addition of Whole Numbers

Using a procedure similar to the one indicated in Unit #9, develop addition facts, sums 13, 14

(2 lessons)

**

14. Subtraction of Whole Numbers

Using a procedure similar to the one indicated in Unit #10, develop subtraction facts, minuends 13, 14

(2 lessons)

***

15. Geometry

Use a pegboard to reinforce and explore properties of geometric figures such as rectangle, square, triangle, circle

(1 lesson)

**

16. Addition of Whole Numbers

Using a procedure similar to the one indicated in Unit #9, develop addition facts, sums 15, 16, 17, 18
Develop column addition (more than two addends) sums through 18

(3 lessons)

**

17. Subtraction of Whole Numbers

Using a procedure similar to the one indicated in Unit #10, develop subtraction facts, minuends 15, 16, 17, 18

(2 lessons)

****

18. Problem Solving

Reinforce basic addition and subtraction facts
Express problems in mathematical sentences

(2 lessons)

*
19. Number: Fractional numbers

Reinforce concept of halves of whole; equivalence, e.g., $\frac{3}{2} = 1\frac{1}{2}$
Number ray to picture fractional numbers

(1 lesson)

***
20. Measurement: Time: Clock

Reinforce and develop concept of hour, half-hour

(1 lesson)

**
21. Addition and Subtraction of Whole Numbers

Use concept of related operations to reinforce basic addition and subtraction facts, e.g., $5 + 3 = 8$ $\quad 3 + 5 = 8$
$8 - 3 = 5$ $\quad 8 - 5 = 3$

(2 lessons)

*
22. Numeration

Using a procedure similar to the one indicated in Unit #6, develop grouping by tens and ones to 99
Record using expanded notation, e.g., 73 = 7 tens + 3 ones
= 70 + 3

(2 lessons)

***
23. Measurement: Money

Develop relationships between quarter, half-dollar

(1 lesson)

**
24. Addition and Subtraction of Whole Numbers

a. sum of two addends, one expressed by 2-digit numeral and the other expressed by 1-digit numeral, sums in the same decade, using horizontal form, e.g., $23 + 4 = 27$
$33 + 4 = 37$
$43 + 4 = 47$, etc.

b. subtraction as the related operation to addition, e.g., $27 - 4 = 23$
$37 - 4 = 33$
$47 - 4 = 43$

(3 lessons)

**
25. Addition and Subtraction of Whole Numbers

a. sum of two addends, one expressed by 2-digit numeral and the other expressed by 1-digit numeral, sums reaching the next decade, using horizontal form, e.g, $23 + 7 = 30$
$33 + 7 = 40$
$43 + 7 = 50$, etc.

b. subtraction as the related operation to addition, e.g., 30 - 7 = 23
40 - 7 = 33
50 - 7 = 43, etc.
(4 lessons)

**
26. Addition and Subtraction of Whole Numbers

a. sum of two addends, one expressed by 2-digit numeral and the other expressed by 1-digit numeral, sums bridging ten, using horizontal form, e.g., 23 + 8 = 31
33 + 8 = 41
43 + 8 = 51, etc.

b. subtraction as the related operation to addition, e.g., 31 - 8 = 23
41 - 8 = 33
51 - 8 = 43, etc.
(4 lessons)

*
27. Number: Fractional numbers

Reinforce concept of fourths of whole; equivalence, e.g., $\frac{2}{4} = \frac{1}{2}$; $\frac{5}{4} = 1\frac{1}{4}$
Number ray
(2 lessons)

***
28. Measurement: Temperature

Use a ribbon thermometer to record scale by tens, by fives, by twos
(1 lesson)

*
29. Number

Counting forward and backward by twos, with and without materials
Develop concepts of odd and even numbers
(1 lesson)

*
30. Sets:

Use physical objects to extend concepts of one-to-one correspondence to include many-to-one matching; one-to-many matching, e.g.,
4 crayons matched with one child
one child matched with 4 crayons
(1 lesson)

**
31. Multiplication of Whole Numbers

Using physical objects, develop concept of multiplication as the union of equivalent sets
Provide experience situations to develop 2 twos; 3 twos; 4 twos; 5 twos
(3 lessons)

**

32. Division of Whole Numbers

Using physical objects, develop concept of division as related to partitioning a set into equivalent subsets
Provide experience situations to count backward by twos and to find the number of twos in 4; the number of twos in 6; the number of twos in 8; the number of twos in 10

(3 lessons)

**

33. Subtraction of Whole Numbers

Using physical objects and mathematical sentences, develop subtraction as comparison - difference. For example, how-many-more-are-needed situations, $6 + \square = 9$; who has more marbles; who has fewer marbles

(2 lessons)

****

34. Concepts from Algebra: Use number sentences

Develop rule for substitution
For example, $\square + \square = 8$ Since both placeholders are alike the same
$4 + 4 = 8$ numeral is used for each frame

$\square + \Delta = 8$ Since both placeholders are not alike the
$3 + 5 = 8$ same numerals may or may not be used
$2 + 6 = 8$
$4 + 4 = 8$

(1 lesson)

***

35. Measurement: Linear

Using experiences involving measurement, develop foot-inch relationships

(1 lesson)

**

36. Addition of Whole Numbers

Develop adding tens and multiples of ten to numbers named by two-digit numerals, sums through 99 and beyond

For example,			
	$10 + 10 = \square$	$21 + 10 = \square$	$21 + 10 = \square$
	$10 + 20 = \square$	$22 + 10 = \square$	$21 + 20 = \square$
	$10 + 30 = \square$	$23 + 10 = \square$	$21 + 30 = \square$
	etc.	etc.	etc.

(2 lessons)

**

37. Addition of Whole Numbers

Sum of two addends, each expressed by 2-digit numerals, sums of ones or units nine or less
Lead to vertical format, e.g., 43 4 tens + 3 ones or $40 + 3$
$+15$ 1 ten + 5 ones $10 + 5$
5 tens + 8 ones or 58 $50 + 8$ or 58

Column addition, no exchange

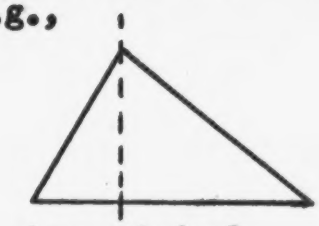
(3 lessons)

***

38. Geometry

Experiment with materials to discover and recognize the differences between symmetrical and asymmetrical patterns, e.g.,

Symmetrical



Asymmetrical

(1 lesson)

*

39. Number

Counting forward and backward by threes, with and without materials to 15 and beyond as readiness for multiplication
Reinforce concept of odd and even numbers

(1 lesson)

**

40. Multiplication of Whole Numbers

Using a procedure similar to the one indicated in Unit #31, and counting by threes with and without materials, develop 2 threes; 3 threes; 4 threes; 5 threes

(2 lessons)

**

41. Division of Whole Numbers

Using a procedure similar to the one indicated in Unit #32, develop the number of threes in 6; in 9; in 12; in 15

(2 lessons)

*

42. Number: Fractional numbers

Using activities, develop concept of thirds of a whole; compare with halves and fourths, e.g., $\frac{1}{3} < \frac{1}{2}$

(2 lessons)

***

43. Measurement: Linear

Using experiences, reinforce foot-inch relationships and develop concept of half-inch

(2 lessons)

*

44. Number; Numeration: Roman numerals

Use physical objects to group by fives and record using Roman numerals I-X

(2 lessons)

*

45. Numeration

Develop rounding numbers to nearest ten to prepare children for estimating solutions to problems

(2 lessons)

**

46. Addition of Whole Numbers

Sum of 2 addends each named by a 2-digit numeral; sums of units 10 or more, sums less than 100
Lead to vertical format with exchange - ones for tens

For example,

43	4 tens + 3 ones	or 40 + 3	or	43
+18	1 ten + 8 ones	10 + 8		18
	5 tens + 11 ones	50 + 11 or 61		11 (3+8)
				50 (40+10)
	6 tens + 1 one or 61			61

(2 lessons)

**

47. Subtraction of Whole Numbers

Develop subtracting tens and multiples of ten from numbers named by 2-digit numerals

For example,

50 - 10 = □	26 - 10 = □	60 - 20 = □	56 - 20 = □
60 - 10 = □	36 - 10 = □	50 - 20 = □	46 - 20 = □
70 - 10 = □	46 - 10 = □	40 - 20 = □	36 - 20 = □
etc.	etc.	etc.	etc.

(3 lessons)

**

48. Subtraction of Whole Numbers

Develop subtraction where minuend and subtrahend are each named by a 2-digit numeral; value of ones in minuend more or equal to value of ones in subtrahend (no exchange)
Lead to vertical format, e.g.,

26	20 + 6	
-15	10 + 5	
	10 + 1	or 11

(2 lessons)

****

49. Problem Solving: Develop procedure for analyzing and solving problem

a. select information to be used in solving problem
b. select operation to be used and give reasons
c. express problem in different ways using mathematical sentences
d. use estimation

(2 lessons)

**

50. Multiplication of Whole Numbers

Using a procedure similar to the one indicated in Unit #31, and counting by fours with and without materials, develop 2 fours; 3 fours; 4 fours; 5 fours

(2 lessons)

**

51. Division of Whole Numbers

Using a procedure similar to the one indicated in Unit #32, develop finding the number of fours in 8; in 12; in 16; in 20

(2 lessons)

*

52. Numeration: Use physical objects to

a. group by tens to 100
b. record 10 tens = 100
c. reinforce concept of place value to 100

(2 lessons)

***

53. Measurement: Money

Develop concept of value of 1 dollar
Relationships among 1¢; 10¢; 100¢

(1 lesson)

**

54. Addition of Whole Numbers

Reinforce adding numbers named by 2-digit numerals, sums less than 100
Lead to column addition

(1 lesson)

**

55. Subtraction of Whole Numbers

Develop regrouping minuends (tens for ones)
For example,

43	40 + 3	30 + 13
-26	20+ 6	20 + 6
		10 + 7 or 17

(3 lessons)

***

56. Measurement: Capacity

Using experiences, reinforce concept of quart, of cup (8 oz.), and develop concept of pint

(1 lesson)

*

57. Numeration: Roman numerals

Use physical objects to group by fives; by tens, and record using Roman numerals I-X and beyond

(2 lessons)

**

58. Multiplication of Whole Numbers

Using a procedure similar to the one indicated in Unit #31, and counting by fives with and without materials, develop 2 fives; 3 fives; 4 fives; 5 fives

(2 lessons)

**

59. Division of Whole Numbers

Using a procedure similar to the one indicated in Unit #32, develop finding the number of fives in 10; in 15; in 20; in 25

(2 lessons)

**

60. Operations: Fractional numbers

Using physical objects, reinforce finding $\frac{1}{2}$ of a number of things; develop finding $\frac{1}{4}$ of a number of things

(2 lessons)

***

61. Measurement: Quantity

Using experiences, develop concept of dozen; of half-dozen

(1 lesson)

**

62. Multiplication of Whole Numbers

Using physical objects, develop understanding of Commutative Property for Multiplication
Reinforce multiplication facts by using Commutative Property for Multiplication

(2 lessons)

***

63. Measurement: Weight

Using experiences, reinforce concept of standard unit of weight - pound, and develop concept of ounce

(1 lesson)

****

64. Statistics

Using test results and other experiences, develop concept of range; of mode; use tallying; bar graph

(1 lesson)

****

65. Probability

Develop concept of probability as related to chance events with 2 possible outcomes, e.g., tossing a coin

(1 lesson)

****

66. Reasoning

Discover transitivity relationship, e.g., John is taller than Mary. Mary is taller than Robert. Therefore, John is taller than Robert.

Reinforce understanding of "If-then" reasoning
For example, Rule: If it rains today, then we will play indoors.
It is raining today.
Conclusion: Then we will play indoors.

Develop understanding of converse as the result of interchanging the "If" phrase and the "then" phrase.
For example, If we play indoors, then it will rain today.

Note: The converse is not necessarily true even if the original statement is true.

(1 lesson)

* 67. Numeration: Use materials such as base blocks, squared materials to

a. count by hundreds
b. count by hundreds and tens to ten hundreds

(2 lessons)

MATHEMATICS: GRADE 3

The scope and sequence for Grade 3 is presented in the form of 69 units for which a minimum of 122 teaching lessons is indicated.

The development of concepts and operations is presented in a cyclic pattern. For example, the development of multiplication facts begins in Unit 7, continues in Units 14, 25, 35, 40, 43, 47 and this understanding is reinforced and extended in Units 51, 53, 56, 57, and 65.

To provide a brief overview of the mathematical understandings and skills for Grade 3, the following is presented:

Mathematical Understandings for Grade 3

1. Number; Numeration

   Count by thousands to ten thousand
   Understand place value and record in expanded notation to 1000
   Round numbers to nearest hundred

2. Addition

   Algorithm: vertical format, two addends, sums through 999, two exchanges
   Column addition: more than two addends, sums through 999, with exchange
   Addition in dollars-cents system
   Addition and subtraction as related operations
   Observe and use commutative and associative properties of addition

3. Subtraction

   Algorithm: vertical format, regrouping minuend 1 hundred for 10 tens, 1 ten for 10 ones
   Subtraction in dollars-cents system
   Subtraction as comparison-difference, missing addend

4. Multiplication

   Basic facts
   Algorithm: horizontal format and vertical format, number named by 2-digit numeral multiplied by number named by 1-digit numeral, with and without exchange
   Observe and use the commutative property of multiplication, the distributive property of multiplication over addition, the role of 1 and 0 in multiplication

5. Division

   Basic facts
   Algorithm: vertical format, divisors 1 - 9, dividends 99 or less

6. Fractional Numbers

Concept: sixths, eighths of a whole
Finding $\frac{1}{6}$, $\frac{1}{8}$ of a number of things
Equivalence: halves, thirds, sixths
halves, fourths, eighths

7. Geometry

Concepts: curve, closed curve, simple closed curve, polygon
Properties of plane figures: quadrilateral, rectangle, square, triangle
Line symmetry

8. Measurement

Linear: yard
Capacity: gallon
Weight: fractional parts of pound
Time: clock - 5-minute intervals, A.M., P.M.
calendar - number of weeks in month, writing date month/day/year
Temperature: above and below zero degrees
Speed: non-numerical comparison of time and speed

9. Other Content Included

Concepts from sets, algebra, and probability; problem solving and reasoning

MATHEMATICS: GRADE 3

Preliminary Scope and Sequence

*

1. Sets:

Use physical objects to reinforce set concepts: meaning of set, elements of a set, number property of a set, subsets

Present set notation: describe sets
a. by words, e.g., set of even numbers less than 6
b. use braces and list members of the set, e.g., {2,4}

(1 lesson)

****

2. Mathematical Sentences:

Reinforce concept of mathematical sentence: use of placeholder(s), use of symbols +, -, =, >, < to write number stories as mathematical sentences

Use symbol ≠

(1 lesson)

***

3. Measurement: Time-Clock

Reinforce concept of hour and half-hour
Develop concept of minute, number of minutes in an hour; telling time in quarter hours
Introduce terms: minute marks, after the hour, before the hour

(2 lessons)

**

4. Addition of Whole Numbers:

Reinforce basic facts, sums through 18
a. construct addition table
b. observe and use commutative and associative properties of addition
c. role of zero as the identity element of addition
d. column addition, 3 or more addends
e. use devices such as number wheel, number ladder, etc.
f. addend + addend = sum

(2 lessons)

**

5. Subtraction of Whole Numbers:

Reinforce basic facts, minuends 18 or less
a. addition and subtraction as related operations
b. subtraction as comparison - difference (missing addend): addend + ☐ = sum

c. role of zero as identity element of subtraction
d. use devices such as number wheel, number ladder, etc.

(2 lessons)

***

6. Measurement: Time: Calendar

Using projects involving experiences, develop an understanding of the number of weeks in a month, etc.
Record date as: month/day/year

(1 lesson)

**

7. Multiplication of Whole Numbers:

Using rectangular arrays reinforce concept of multiplication
Develop basic multiplication facts: twos through 5 twos; threes through 5 threes
Record horizontally and vertically, e.g., $5 \times 2 = \square$ $\begin{array}{r} 2 \\ \times 5 \\ \hline \end{array}$
Observe and use commutative property of multiplication, e.g., $5 \times 2 = 2 \times 5$

(2 lessons)

**

8. Division of Whole Numbers:

Reinforce concept of division by relating division to partitioning a set into equivalent subsets
Develop basic division facts: twos in 4; in 6; in 8; in 10
Threes in 6; in 9; in 12; in 15

Record $2\overline{)4}$ $4 \div 2 = \square$
Develop understanding of multiplication and division as related operations

(2 lessons)

**

9. Operations: Fractional numbers

Using physical objects, recall concept of thirds and develop finding $\frac{1}{3}$ of a number of things

(1 lesson)

***

10. Measurement: Weight

Using project experiences, reinforce meaning of pound and ounce
Develop fractional parts of a pound: $\frac{1}{2}$, $\frac{1}{4}$
Record: $\frac{1}{2}$ of 16 oz. = 8 oz., $\frac{1}{4}$ of 16 oz. = 4 oz.

(1 lesson)

*

11. Numeration:

Use materials such as squared materials, abacus, etc. to
a. count by hundreds and tens to 10 hundreds
b. count by hundreds and ones to 10 hundreds

c. group by hundreds and tens and ones and record using expanded notation,
e.g., 1 hundred + 2 tens + 3 ones
100 + 20 + 3
123

(2 lessons)

**

12. Addition of Whole Numbers:

Sum of two addends, one expressed by 2-digit numeral and the other expressed by 1-digit numeral, sums in hundreds using horizontal format,
e.g., 91 + 9 = n
92 + 9 = n

(2 lessons)

**

13. Subtraction of Whole Numbers:

Reinforce and develop regrouping minuends (one ten = 10 ones)
Use minuend through 99, e.g.,

82	8 tens + 2 ones	7 tens + 12 ones
-34	3 tens + 4 ones	3 tens + 4 ones
		4 tens + 8 ones or 48

or

82	80 + 2	70 + 12
-34	30 + 4	30 + 4
		40 + 8 or 48

(2 lessons)

**

14. Multiplication of Whole Numbers:

Reinforce facts for twos through 5 twos; for threes through 5 threes
Develop facts for twos through 9 twos; for threes through 9 threes
Record horizontally and vertically
Observe and use commutative property of multiplication

(2 lessons)

**

15. Division of Whole Numbers:

Reinforce facts for twos through the number of twos in 10; for threes through the number of threes in 15
Develop facts for twos in 12; in 14; in 16; in 18; for threes in 18; in 21; in 24; in 27

Record: $2\overline{)12}$ $12 \div 2 = \square$

(2 lessons)

****

16. Problem Solving:

Reinforce basic facts: addition, subtraction, multiplication, division
Express problem conditions by mathematical sentences

(1 lesson)

***

17. Geometry:

Using physical models, reinforce concept of point, line segment, line, and ray
Develop understanding of space, curve, closed curve, simple closed curve

(2 lessons)

**

18. Addition of Whole Numbers:

Develop adding ten and multiples of ten to numbers through 99, sums in hundreds
Record horizontally and vertically, e.g.,

56 + 10 = n
56 + 20 = n
etc.

56 + 50 = n
56 + 60 = n
etc.

$$\begin{array}{r} 56 \\ +60 \\ \hline \end{array} \qquad \begin{array}{r} 50 + 6 \\ 60 + 0 \\ \hline 110 + 6 \text{ or } 116 \end{array} \qquad \text{or} \qquad \begin{array}{r} 56 \\ 60 \\ \hline 6 \quad (6+0) \\ 110 \quad (50+60) \\ \hline 116 \end{array}$$

(2 lessons)

**

19. Subtraction of Whole Numbers:

Develop subtracting ten and multiples of ten from numbers in the hundreds, horizontal format, e.g.,

100 - 10 = n
200 - 10 = n
etc.

100 - 20 = n
200 - 20 = n
etc.

211 - 10 = n
211 - 20 = n
etc.

(2 lessons)

*

20. Numeration:

Using a procedure similar to the one indicated in Unit #11, count and fill in sequences to ten hundreds

(2 lessons)

**

21. Addition and Subtraction of Whole Numbers:

a. adding numbers 0 - 9 to numbers in the hundreds, e.g.,

154 + 5 = n
167 + 2 = n

119 + 3 = n
138 + 5 = n

b. subtracting numbers 0 - 9 from numbers in the hundreds, e.g.,

159 - 5 = n
169 - 2 = n

122 - 3 = n
152 - 3 = n

(2 lessons)

**

22. Addition of Whole Numbers:

Develop adding ten and multiples of ten to numbers in the hundreds, sums in the next hundred
Record horizontally and vertically, e.g.,

185 + 10 = ☐
185 + 20 = ☐
185 + 30 = ☐
etc.

185
+ 30
5
110
100
215

185
+ 30
215

(2 lessons)

**

23. Subtraction of Whole Numbers:

Develop subtracting from numbers in hundreds, by exchanging one hundred for ten tens, e.g.,

124 - 10 = n
124 - 12 = n
124 - 14 = n
etc.

119 Regroup 1 hundred + 1 ten + 9 ones as 11 tens + 9 ones
- 45 4 tens + 5 ones 4 tens + 5 ones
7 tens + 4 ones or 74

(3 lessons)

***

24. Measurement: Time: Clock

Use projects involving experiences to develop understanding of A.M.; P.M.; telling time in 5-minute intervals

(1 lesson)

**

25. Multiplication of Whole Numbers:

Reinforce facts for twos; for threes
Using distributive property of multiplication over addition, extend multiplication beyond 9 twos, e.g.,

9 x 2 = 18
10 x 2 = (9+1) x 2
10 x 2 = (9x2) + (1x2)
= 18 + 2
= 20

13 x 2 = (10+3) x 2
= (10x2) + (3x2)
= 20 + 6
= 26

Develop facts for fours through 5 fours; for fives through 5 fives
Observe and use commutative property of multiplication

(3 lessons)

**

26. Division of Whole Numbers:

Reinforce facts for twos; for threes
Develop facts for fours in 8; in 12; in 16; in 20; for fives in 10; in 15; in 20; in 25

(2 lessons)

*

27. Number: Fractional numbers

Using activities, reinforce concept of thirds of a whole
Develop: concept of sixth of a whole
understanding of equivalence: thirds—sixths
meaning of terms numerator, denominator
Use number ray

(2 lessons)

**

28. Operations: Fractional numbers

Using physical objects, reinforce finding $\frac{1}{2}$ of a number of things; $\frac{1}{3}$ of a number of things; and develop finding $\frac{1}{6}$ of a number of things
Develop finding $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{6}$ of numbers

(2 lessons)

**

29. Addition of Whole Numbers:

Develop adding hundreds to hundreds, sums to 10 hundreds, e.g.,
100 + 100 = n
100 + 200 = n
etc.
Lead to vertical format with exchange, tens for hundreds, sums to 999
Column addition, 3 or more addends

(3 lessons)

**

30. Subtraction of Whole Numbers:

Develop subtracting hundreds from hundreds, e.g.,
600 - 100 = n
600 - 200 = n
etc.
Lead to vertical format regrouping minuend by exchanging one hundred for ten tens, e.g.,
236 - 153 = n

236 Regroup 2 hundreds + 3 tens + 6 ones as 1 hundred + 13 tens + 6 ones
-153 1 hundred + 5 tens + 3 ones 1 hundred + 5 tens + 3 ones
8 tens + 3 ones
or 83

(3 lessons)

out of two; one chance in two, e.g., each time a coin is tossed fairly, the chance of heads turning up is one chance out of two

(1 lesson)

****

69. Reasoning:

Reinforce transitivity relationship with experiences and apply reasoning to number relationships, e.g.,

since $7 + 1 = 8$ and $8 = 4 + 4$, then $7 + 1 = 4 + 4$

since $3 > 2$ and $2 > 1$, then $3 > 1$

Develop understanding of difference between a statement and a deduction, e.g.,

Two coins are in a box. The value of the coins is 15¢. The dime is taken out. What coin is left in the box?

(1 lesson)